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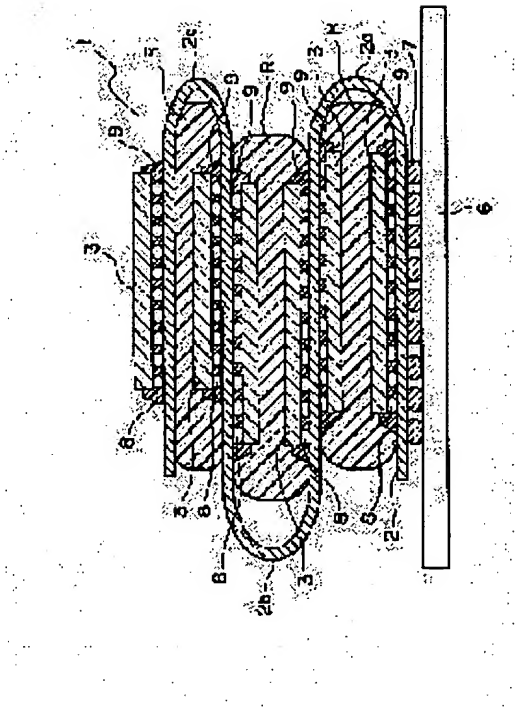
(54) ELECTRONIC DEVICE AND METHOD FOR MANUFACTURING THE SAME

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an electronic device such as a multi-chip module which has a plurality of electronic elements mounted on a substrate with a high density and which can reduce an area occupied by the device, and also to provide a method of manufacturing such an electronic device.

SOLUTION: The electronic device includes a flexible substrate 2 as folded in a stacked form, semiconductor chips 3 mounted on surfaces of the substrate 2, and an adhesive R which is applied between gaps defined by opposing surfaces of the folded substrate 2 and which is made of an insulating material to fix the opposing surfaces.



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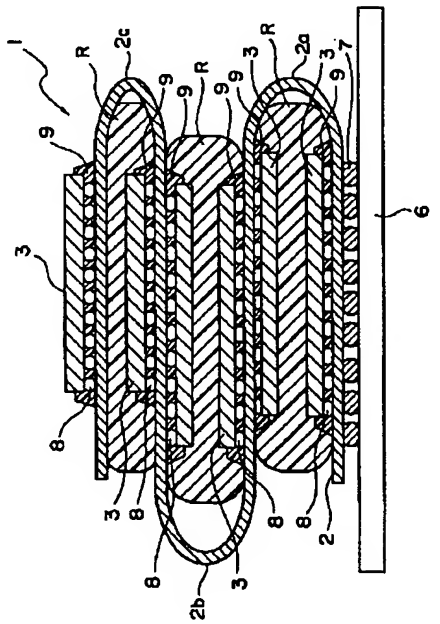
(54)【発明の名称】　電子装置およびその製造方法

(57)【要約】
【課題】マルチチップモジュールのように複数の電子素子が基板に高密度に実装された電子装置において、装置の占有する面積の縮小化が可能な電子装置およびその製造方法を提供する。
【解決手段】折り重ねられた可撓性を有するフレキシブル基板２と、フレキシブル基板２の表面に搭載された半導体チップ３と、折り重ねられたフレキシブル基板２の対向する対向面間に充填され、当該対向面間を固定する絶縁性材料からなる接着剤Ｒとを備える。



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【特許請求の範囲】

【請求項1】折り重ねられた可撓性を有するフレキシブル基板と、

前記フレキシブル基板の表面に搭載された電子素子と、前記折り重ねられたフレキシブル基板の対向する対向面間に充填され、当該対向する対向面間を固定する絶縁性材料からなる接着剤とを備える電子装置。

【請求項2】前記電子素子は、前記フレキシブル基板の折り曲げ部以外の領域に搭載されている請求項1に記載の電子装置。

【請求項3】前記フレキシブル基板は、3層以上に折り重ねられている請求項1に記載の電子装置。

【請求項4】前記電子素子は、前記折り重ねられたフレキシブル基板の互いに対向する面に搭載されている請求項1に記載の電子装置。

【請求項5】前記フレキシブル基板は、前記電子装置が搭載されるベース基板に接続される接続ランドを当該フレキシブル基板の長手方向の一端部に備えている請求項1に記載の電子装置。

【請求項6】前記接続ランドは、格子状に配列されている請求項5に記載の電子装置。

【請求項7】前記電子素子は、前記フレキシブル基板にフリップチップ実装されている請求項1に記載の電子装置。

【請求項8】前記電子素子は、ベアチップの状態で前記フレキシブル基板に搭載されている請求項1に記載の電子装置。

【請求項9】前記接着剤は、前記フレキシブル基板の対向面に搭載された電子素子を覆うように充填されている請求項1に記載の電子装置。

【請求項10】可撓性を有するフレキシブル基板の表面に電子素子を搭載する工程と、

前記フレキシブル基板を折り重ねた際に互いに対向する対向面となる領域に絶縁性材料からなる接着剤を塗布する工程と、

前記フレキシブル基板を折り重ね、前記対向面間を接合する工程とを有する電子装置の製造方法。

【請求項11】前記電子素子を搭載する工程は、前記フレキシブル基板を折り重ねた際に互いに対向する対向面となる領域に前記電子素子を搭載する請求項10に記載の電子装置の製造方法。

【請求項12】前記接着剤を塗布する工程は、前記接着剤を前記対向面に搭載された電子素子を覆うように塗布する請求項11に記載の電子装置の製造方法。

【請求項13】前記電子素子を搭載する工程は、前記電子素子をフリップチップ実装する請求項10に記載の電子装置の製造方法。

【請求項14】可撓性を有するフレキシブル基板の表面に電子素子を搭載する工程と、

前記フレキシブル基板を折り重ねた際に互いに対向する

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対向面となる領域に絶縁性材料からなる接着剤を塗布する工程と、

前記フレキシブル基板を折り重ね、前記対向面間を接合する工程と、

接合された前記フレキシブル基板をベース基板に搭載する工程とを有する電子装置の製造方法。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、電子装置および電子装置の製造方法に関する。

【0002】

【従来の技術】近年、電子機器のディジタル化および信号の高速化等の変化に伴い、電子機器へのノイズの抑制や電子機器の軽薄短小化の要請が強い。また、近年の電子機器では、多数の電子素子等の電子部品を搭載しており、チップ間の信号遅延を抑制する必要もある。このような要請に応えるために、たとえば、複数のチップを基板上に互いに近づけて配置し、高密度に実装し、チップ間の信号遅延を抑制することが行われている。上述のような高密度実装を実現する技術として、具体的には、フレキシブル基板等のプリント配線板に複数のベアチップを搭載して一つの部品とし、これをベース基板に実装するいわゆるマルチチップモジュール（Multi-Chip Module:MCM）が知られている。

【0003】図15は、マルチチップモジュールの構造の一例を示す断面図である。図15に示すマルチチップモジュールは、複数個のチップ102を配線パターンが形成されたモジュール基板101に高密度に実装しており、これによりチップ102間の信号遅延を低減させている。また、モジュール基板101のチップ102の非搭載側面には、複数の接続ランドが形成されており、各接続ランドは、たとえば、はんだバンプ等の接続材料106を介してベース基板105側の対応する接続ランドに電気的に接続されている。さらに、モジュール基板101およびベース基板105に形成されている接続ランドは、モジュール基板101とベース基板105との接続強度を強化するために、エリアアレイ配置を採用している。

【0004】上記のようなマルチチップモジュールでは、チップ102のモジュール基板101への実装方法は、たとえば、チップ102のパッドとモジュール基板のランドとを金線ワイヤ等の接続部材で結線したワイヤボンディング方式や、テープキャリア上に形成したCu等の材料からなる薄膜パターンのインナーリードと電子素子のパッドとをインナーリードボンディングするTAB方式や、チップのパッド上に金等からなるバンプを形成した後、チップの能動素子面を基板に向けて直接接続するフリップチップ接続等の方法が知られている。これらの接続方法を用いてベアチップをチップサイズのままモジュール基板に実装することで、高密度実装を行って

いる。

【０００５】

【発明が解決しようとする課題】ところで、上述したように高密度実装を実現するためにベアチップを平面的に搭載するマルチチップモジュールにおいては、搭載するチップが、たとえば、２個から４個に増えた場合に、モジュール基板の実装に必要な面積も略２倍に増加してしまう。このように、従来においては、搭載するチップの面積、個数の増加に対しては、モジュール基板の面積を拡大させる必要がある。モジュール基板の面積を拡大させると、結果として、マルチチップモジュールが適用される電子機器の小型化（面積の縮小化）が困難になるという不利益が存在する。

【０００６】本発明は、マルチチップモジュールのように複数の電子素子が基板に高密度に実装された電子装置において、装置の占有する面積の縮小化が可能な電子装置およびその製造方法を提供することを目的とする。

【０００７】

【課題を解決するための手段】本発明の電子装置は、折り重ねられた可撓性を有するフレキシブル基板と、前記フレキシブル基板の表面に搭載された電子素子と、前記折り重ねられたフレキシブル基板の対向する対向面間に充填され、当該対向する対向面間を固定する絶縁性材料からなる接着剤とを備える。

【０００８】好適には、前記電子素子は、前記フレキシブル基板の折り曲げ部以外の領域に搭載されている。

【０００９】好適には、前記電子素子は、前記折り重ねられたフレキシブル基板の互いに対向する面に搭載されている。

【００１０】好適には、前記接着剤は、前記フレキシブル基板の対向面に搭載された電子素子を覆うように充填されている。

【００１１】本発明の電子装置の製造方法は、可撓性を有するフレキシブル基板の表面に電子素子を搭載する工程と、前記フレキシブル基板を折り重ねた際に互いに対向する対向面となる領域に絶縁性材料からなる接着剤を塗布する工程と、前記フレキシブル基板を折り重ね、前記対向面間を接合する工程とを有する。

【００１２】また、本発明の電子装置の製造方法は、可撓性を有するフレキシブル基板の表面に電子素子を搭載する工程と、前記フレキシブル基板を折り重ねた際に互いに対向する対向面となる領域に絶縁性材料からなる接着剤を塗布する工程と、前記フレキシブル基板を折り重ね、前記対向面間を接合する工程と、接合された前記フレキシブル基板をベース基板に搭載する工程とを有する。

【００１３】本発明では、電子素子が搭載されたフレキシブル基板を折り重ね、折り曲げたフレキシブル基板の対向面間に接着剤を充填して固定する。すなわち、電子素子が搭載されたフレキシブル基板は、平面的に展開すると、比較的広い面積を有するが、フレキシブル基板を折り重ね、電子素子が積層された構造とすることで、電子装置の占める面積を縮小化できる。言い換えれば、電子装置の占める面積を縮小化できる分、電子素子の高密度実装が可能となる。また、折り重ねたフレキシブル基板の対向面間に絶縁性の接着剤を充填して可撓性を有するフレキシブル基板を固定することで、新たにパッケージ等に電子素子が搭載されたフレキシブル基板を収容する必要がない。

【００１４】

【発明の実施の形態】以下、本発明の実施の形態について図面を参照して説明する。図１は、本発明の電子装置の一実施形態に係るマルチチップモジュールの構造を示す断面図である。図１において、マルチチップモジュール１は、折り重ねられたフレキシブル基板２と、フレキシブル基板２の表面に搭載された本発明の電子素子としての複数の半導体チップ３と、折り重ねられたフレキシブル基板２の対向する各対向面間に充填された接着剤Ｒとを備えている。このマルチチップモジュール１は、リジッドなベース基板６上に搭載されている。

【００１５】ベース基板６は、柔軟性のない硬質性の基板に、たとえば、Ｃｕ等の導電材料で導電配線パターンを形成したものである。具体的には、ガラス布を基材としエポキシ樹脂やイミド樹脂等の樹脂を含浸して固めた絶縁性の基板に導電性の配線パターンをプリントしたリジッドプリント配線板である。

【００１６】フレキシブル基板２は、たとえば、可撓性、絶縁性を有するベースフィルムに、導電性の配線パターンを形成し、この配線パターンをカバーフィルムで被覆した基板である。たとえば、ポリエステルやポリイミド等の樹脂から成形したベースフィルムに、プリント技術によって導電性の配線パターンを形成し、この配線パターンカバーフィルムで覆っている。フレキシブル基板２の厚さは、たとえば、３０μｍ程度である。

【００１７】このフレキシブル基板２は、所定幅の連続する一枚の基板からなっており、フレキシブル基板２の長手方向に沿った３つの折曲部２ａ、２ｂおよび２ｃで折り曲げられることによって、４層に折り重なっている。

【００１８】半導体チップ３は、いわゆるベアチップの状態でフレキシブル基板２の両面の所定の位置に金等の導電性材料からなるバンプ８および異方性導電材料９を介して実装されている。これにより、半導体チップ３に形成された電子回路はフレキシブル基板２に形成された導電配線パターンと電気的に接続されている。また、これら複数の半導体チップ３は、４層に折り重なっているフレキシブル基板２のうちベース基板６側から順に第１層～第４層とすると、フレキシブル基板２の各層の平坦部に搭載されている。すなわち、半導体チップ３は、第１層と第２層の対向面にそれぞれ実装されており、これ

ら第１層と第２層の対向面に実装された半導体チップ３は非実装面が互いに対向している。フレキシブル基板２の第２層と第３層の互いに対向する各対向面にも、それぞれ半導体チップ３が搭載されており、これら第２層と第３層の対向面に実装された半導体チップ３は非実装面が互いに対向している。

【００１９】フレキシブル基板２の第３層と第４層の互いに対向する対向面のうち第３層側の対向面にのみ半導体チップ３が搭載されており、第４層側の対向面には半導体チップ３が搭載されていない。代わりに、フレキシブル基板２の第４層の外側面には半導体チップ３が搭載されている。

【００２０】さらに、フレキシブル基板２の第１層のベース基板６に対向する面には、金等の導電性材料からなる複数のバンプ７と接続される図示しない接続ランドが形成されている。すなわち、フレキシブル基板２の一端部には、複数の接続ランドが形成されている。このフレキシブル基板２の一端部に形成された複数の接続ランドは、フレキシブル基板２とベース基板６との接続を強固にするため、格子状に配列されている。すなわち、フレキシブル基板２の一端部に形成された複数の接続ランドは、縦横に所定のピッチで等間隔に配列されている。フレキシブル基板２の一端部に形成された複数の接続ランドは、バンプ７を介してベース基板６に対応して格子状に形成された接続ランドと接続されている。これによって、フレキシブル基板２とベース基板６とは電気的に接続されている。

【００２１】接着剤Ｒは、絶縁性材料からなり、フレキシブル基板２の第１層と第２層との間、第２層と第３層との間および第３層と第４層との間にそれぞれ充填されて固化している。この接着剤Ｒは、第１層～第４層の各対向面に搭載された半導体チップ３を覆うようにそれぞれ充填されており、フレキシブル基板２の第１層～第４層の相対位置を固定するとともに、対向する半導体チップ３同士が接触するのを防ぐ役割を果たしている。

【００２２】次に、本発明の半導体装置の製造方法について説明する。まず、図２および図３に示すように、フレキシブル基板２の一方面２ｄの所定の位置に半導体チップ３を実装する。半導体チップ３の実装は、たとえば、フリップチップ実装によって行う。なお、図３は図２の平面図である。また、フレキシブル基板２の一方面２ｄの一端部には格子状に複数の接続ランド７が形成されている。

【００２３】ここで、図９～図１４を参照して、半導体チップ３のフレキシブル基板２への実装方法の一例について説明する。図９は、フリップチップ実装によってフレキシブル基板２に実装された半導体チップ３の実装構造を示す断面図である。図９において、フレキシブル基板２に形成された接続ランド２ｆは、半導体チップ３の各接続パッドと、バンプ８および異方性導電性材料９によって接続されている。

【００２４】図９に示す実装構造は、まず、図１０に示すように、半導体チップ３の各接続パッドに、たとえば、金等の導電性材料からなるバンプ８をボンディングして形成する。

【００２５】次いで、図１１に示すように、フレキシブル基板２の表面に異方性導電性材料９をフィルム状にしてカバーテープ１２ａに保持した異方性導電性フィルム１２を貼着する。この異方性導電性材料９は、たとえば、エポキシ樹脂等の樹脂中に銀等の導電性粒子を練り込んでおき、圧力が加えられた方向にのみ電気的に導通し、他方向に対しては絶縁材となる材料である。図１２に示すように、異方性導電性フィルム１２の異方性導電性材料９をフレキシブル基板２の表面に貼着したのち、カバーテープ１２ａを引き剥がす。

【００２６】次いで、図１３に示すように、バンプ８が形成された半導体チップ３を異方性導電性材料９が貼着されたフレキシブル基板２に対してアライメントする。

【００２７】次いで、図１４に示すように、フレキシブル基板２に対して半導体チップ３がアライメントされた状態で、図示しない圧着ヘッドを用いて、半導体チップ３とフレキシブル基板２とを加熱しながら押し付ける。このときの加熱および加圧条件は、たとえば、温度：１６０～１９０℃、圧力：２０～６０ｋｇｆ／cm^2、時間：２０ｓ～３０ｓである。

【００２８】この加熱および加圧によって、異方性導電性材料９に含まれる銀等の導電性粒子は、バンプ８とフレキシブル基板２に形成された接続ランド２ｆとの間を電気的に接続する。以上のような工程を経て半導体チップ３のフレキシブル基板２へのフリップチップ実装が完了する。

【００２９】半導体チップ３のフレキシブル基板２の一方面２ｄへのフリップチップ実装が完了すると、図４に示すように、同様に、フレキシブル基板２の他方面２ｅにも半導体チップ３をフリップチップ実装する。また、半導体チップ３は、フレキシブル基板２の長手方向に沿って略等間隔に実装する。

【００３０】次いで、図５に示すように、フレキシブル基板２の両面に半導体チップ３を実装した状態で、フレキシブル基板２の一端部に形成されたバンプ７の裏面２ｅ側の半導体チップ３上に絶縁性の接着剤Ｒを塗布する。このとき、接着剤Ｒは、ディスペンサ３１を用いて、半導体チップ３を覆うように適量を塗布する。

【００３１】次いで、図６に示すように、接着剤Ｒを塗布した半導体チップ３とこれに隣接する半導体チップ３とが対向するようにフレキシブル基板２をＵ字状に折り曲げ、フレキシブル基板２を折り重ねる。フレキシブル基板２を折り重ねると、フレキシブル基板２の一方面２ｅに実装された２つの半導体チップ３は接着剤Ｒを介して対向した状態となる。すなわち、接着剤Ｒが塗布され

ていなかった半導体チップ３は、フレキシブル基板２の折り重ねにより、接着剤Ｒによって被覆された状態になる。このようなフレキシブル基板２を折り重ねた状態から、接着剤Ｒを硬化させると、図６に示すようなフレキシブル基板２の折り曲げ部２ａが折り曲げられた状態に固定される。

【００３２】次いで、Ｕ字状に折り曲げられた状態にあるフレキシブル基板２に実装された対向した状態にある２つの半導体チップ３の上方に位置するフレキシブル基板２の他方面２ｄに実装された半導体チップ３上に接着剤Ｒを塗布する。上述したと同様に、接着剤Ｒは半導体チップ３を覆うように適量を塗布する。

【００３３】次いで、フレキシブル基板２の他方面２ｄに実装された半導体チップ３に接着剤Ｒが塗布された状態で、フレキシブル基板２がＳ字状になるように折り曲げ、フレキシブル基板２の他方面２ｄに搭載された接着剤Ｒを塗布した半導体チップ３と接着剤Ｒが塗布されていない状態にある半導体チップ３とを接着剤Ｒを介して対向させる。このフレキシブル基板２の他方面２ｄに搭載され接着剤Ｒが塗布されていない状態にあった半導体チップ３は、フレキシブル基板２の折り曲げ部２ｂの折り曲げによる折り重ねにより、接着剤Ｒによって被覆された状態になる。接着剤Ｒの硬化により、フレキシブル基板２はＳ字状に折り重なった状態に固定される。

【００３４】フレキシブル基板２がＳ字状になるように折り重ねることにより、フレキシブル基板２は３層構造となり、最下層の外側面には、接続ランド７が配置され、最下層と第２層の対向面にはそれぞれ半導体チップ３が対向した状態で配置され、第２層と最上層の対向面にもそれぞれ半導体チップ３が対向した状態で配置され、最上層の外側面にも半導体チップ３が搭載された状態のマルチチップモジュールとなる。なお、図１に示した４層構造のマルチチップモジュールを構成しようとする場合には、フレキシブル基板２への半導体チップ３の搭載位置を適宜変更し、かつ、フレキシブル基板２の折り曲げ箇所を３箇所にする必要があるが、基本的な製造方法は同様である。

【００３５】次いで、図８に示すように、上記のような工程を経て完成したマルチチップモジュールをベース基板６に実装する。ベース基板６への実装は、たとえば、ベース基板６の所定の位置に形成された接続ランドに、はんだペースト等の接続材料を塗布し、この接続材料が塗布された位置にフレキシブル基板２の接続ランド７を実装することにより行う。

【００３６】以上のように、本実施形態によれば、複数の半導体チップ３がフレキシブル基板２を介して配置されるので、半導体チップ３間の信号遅延を短縮でき、マルチチップモジュールを適用したシステム全体の高速化、高性能化を図ることができる。また、本実施形態によれば、フレキシブル基板２を折り重ねて半導体チップ３を空間的に積層して高密度実装を実現するため、限られた実装空間を最大限に利用できる。

【００３７】また、本実施形態によれば、半導体チップ３の面積や個数の増加に対応すべくフレキシブル基板２の面積（長さ）を拡大しても、フレキシブル基板２を折り重ねるため、最終的なフレキシブル基板２の占める面積が拡大することがない。さらに、半導体チップ３の面積や個数が増加しても、フレキシブル基板２の面積の拡大を抑えることができるので、結果的に、マルチチップモジュールを搭載するベース基板６の実装のための面積も抑制することができる。

【００３８】また、本実施形態によれば、折り重さなったフレキシブル基板２の間に絶縁性の接着剤Ｒを充填して固定し、かつ、接着剤Ｒで半導体チップ３を被覆して保護するため、折り重さなったフレキシブル基板２を新たにパッケージで包む必要がなく、マルチチップモジュールの製造工程を簡素化できる。すなわち、本実施形態では、接着剤Ｒは折り重さなったフレキシブル基板２を固定するとともに、実装された半導体チップ３を封止する機能を兼ねているので、マルチチップモジュールの構造を簡素化でき、また、信頼性を高めるとおが可能である。

【００３９】また、本実施形態によれば、マルチチップモジュール内の部品の数に変更が生じても、マルチチップモジュール内での再配置が可能であるので、ベース基板６上の部品レイアウトを変更する必要がない。また、このような変更の際には、フレキシブル基板２の階層を増減したり、折り曲げ位置の変更等によって容易に対応することができる。

【００４０】本発明は、上述した実施形態に限定されない。上述した実施形態では、フレキシブル基板２の折り曲げ箇所を２または３にしているが、折り曲げ箇所の数については特に限定されず、さらに多くに階層にすることも可能である。また、折り重ねた後のフレキシブル基板２の各層の表面および裏面に単数の半導体チップ３が設けられている場合について説明したが、さらに多くの半導体チップ３が設けられていてもよく、また、半導体チップ３以外にも他の電子部品が搭載されている構成とすることも可能である。

【００４１】

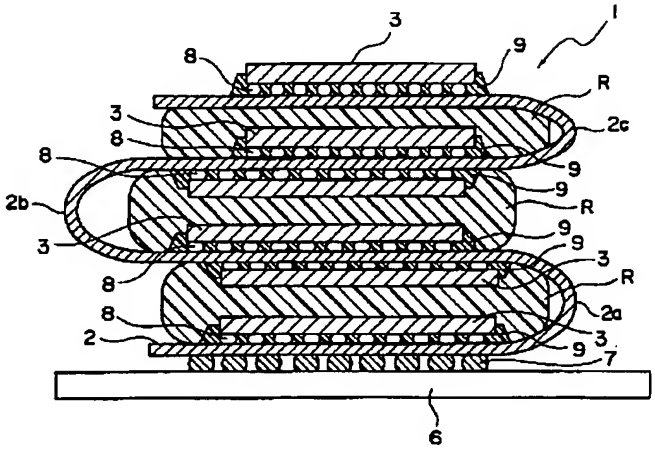
【発明の効果】本発明によれば、マルチチップモジュールのように複数の電子素子が基板に高密度に実装された電子装置において、装置の占有する面積の縮小化が可能となり、また、装置の占有する面積の拡大を抑えつつ高密度実装が可能になる。　また、本発明によれば、絶縁性の接着剤で折り重ねたフレキシブル基板の固定をするとともに、フレキシブル基板に実装された電子素子を封止するので、新たにパッケージを設ける必要がなく、構造を簡素化でき、かつ、信頼性を高めることができる。

【図面の簡単な説明】

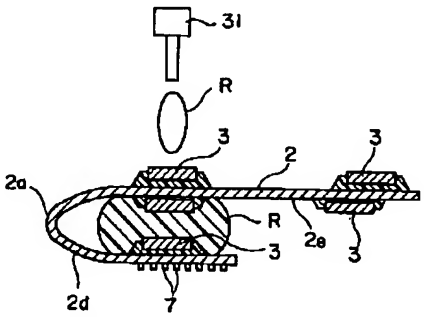
9　10

【図１】本発明の電子装置の一実施形態に係るマルチチップモジュールの構造を示す断面図である。
【図２】図１に示すマルチチップモジュールの製造工程を説明するための断面図である。
【図３】図２に示すフレキシブル基板の平面図である。
【図４】図２に続く製造工程を説明するための断面図である。
【図５】図４に続く製造工程を説明するための断面図である。
【図６】図５に続く製造工程を説明するための断面図である。
【図７】図６に続く製造工程を説明するための断面図である。
【図８】図７に続く製造工程を説明するための断面図である。
【図９】フリップチップ実装されたマルチチップモジュールの構造の一例を示す断面図である。
【図１０】フリップチップ実装の実装工程の一例を説明するための図である。
【図１１】図１０に続く実装工程を説明するための図である。
【図１２】図１１に続く実装工程を説明するための図である。
【図１３】図１２に続く実装工程を説明するための図である。
【図１４】図１３に続く実装工程を説明するための図である。
【図１５】マルチチップモジュールの構造の一例を示す断面図である。
【符号の説明】
1…マルチチップモジュール、2…フレキシブル基板、3…半導体チップ、8…バンプ、R…接着剤。

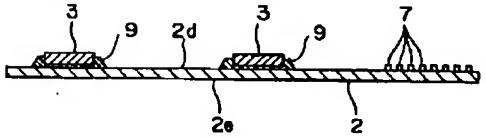
【図１】



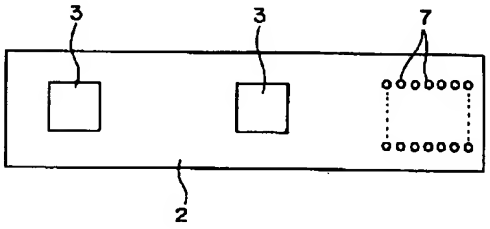
【図６】



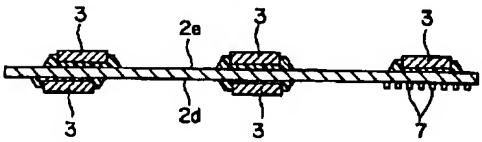
【図２】



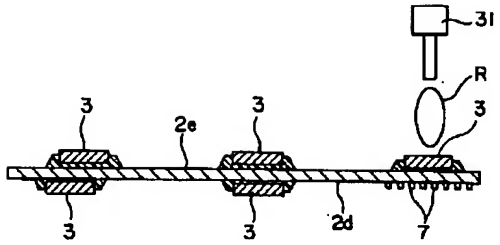
【図３】



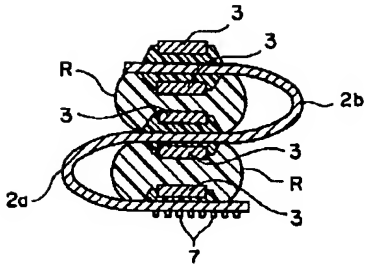
【図４】



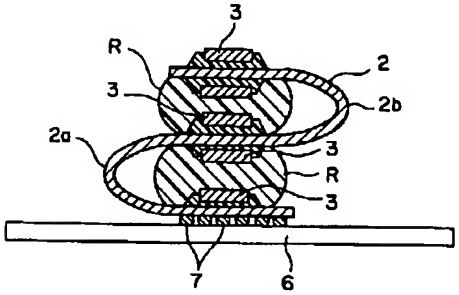
【図5】



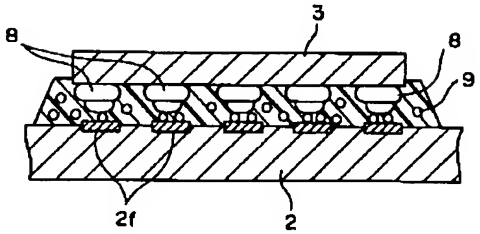
【図7】



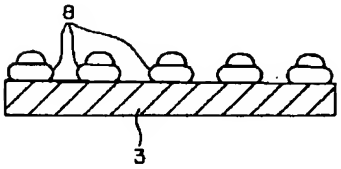
【図8】



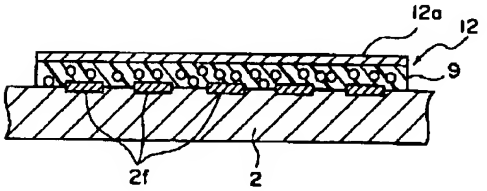
【図9】



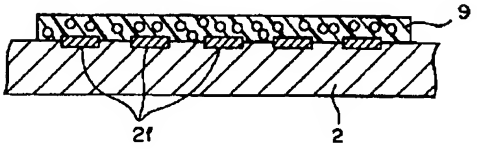
【図10】



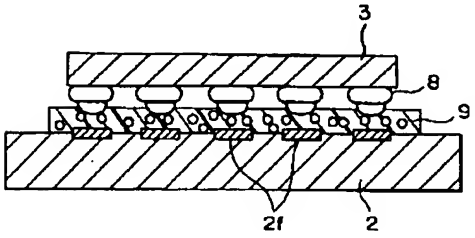
【図11】



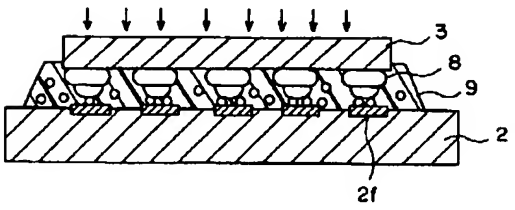
【図12】



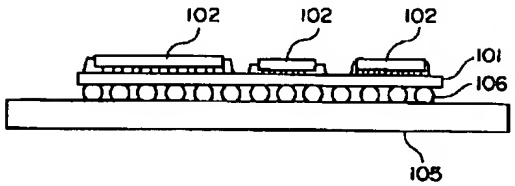
【図13】



【図14】



【図15】



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TECHNICAL FIELD

[Field of the Invention] This invention relates to the manufacture approach of an electronic instrument and an electronic instrument.

[Translation done.]

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] By the way, as mentioned above, in order to realize high density assembly, when the chips which carry a bare chip in the multi chip module carried superficially increase in number from two pieces to four pieces, an area required for mounting of a module substrate will also increase to a twice as many abbreviation as this. Thus, it is necessary to make the area of a module substrate expand in the former to the area of the chip to carry, and the increment in the number. If the area of a module substrate is made to expand, disadvantageous profit that the miniaturization (cutback-izing of area) of the electronic equipment by which a multi chip module is applied becomes difficult as a result exists.

[0006] This invention aims at offering the electronic instrument in which cutback-izing is possible and its manufacture approach of the area which equipment occupies in the electronic instrument with which two or more electronic devices were mounted in the substrate by high density like a multi chip module.

[Translation done.]

PRIOR ART

[Description of the Prior Art] In recent years, in connection with change of digitization of electronic equipment, improvement in the speed of a signal, etc., the request of control of the noise to electronic equipment or small-and-light-izing of electronic equipment is strong. Moreover, electronic parts, such as many electronic devices, are carried and it is necessary to control the signal delay during a chip by electronic equipment in recent years. In order to respond to such a request, two or more chips are close brought mutually on a substrate, and are arranged, and it mounts in high density, and controlling the signal delay during a chip is performed. As a technique of realizing the above high density assembly, two or more bare chips are carried in printed wired boards, such as a flexible substrate, it specifically considers as one component, and the so-called multi chip module (Multi-Chip Module:MCM) which mounts this in a base substrate is known.

[0003] Drawing 15 is the sectional view showing an example of the structure of a multi chip module. The multi chip module shown in drawing 15 mounts two or more chips 102 in the module substrate 101 with which the circuit pattern was formed at high density, and, thereby, is reducing the signal delay during a chip 102. Moreover, two or more connection lands are formed in the side face of the chip 102 of the module substrate 101 in which it does not carry, and each connection land is electrically connected to the connection land to which the base substrate 105 side corresponds through the connection ingredients 106, such as a solder bump. Furthermore, in order to strengthen the connection resilience of the module substrate 101 and the base substrate 105, area array arrangement is used for the connection land currently formed in the module substrate 101 and the base substrate 105.

[0004] In the above multi chip modules, the mounting approach to the module substrate 101 of a chip 102 for example, the pad of a chip 102 and the land of a module substrate -- a gold streak -- the wirebonding method connected by connection material, such as a wire, -- The TAB method which carries out inner lead bonding of the inner lead of a thin film pattern and the pad of an electronic device which consist of ingredients, such as Cu formed on the tape career, After forming the bump who consists of gold etc. on the pad of a chip, approaches, such as flip chip bonding which turns and carries out direct continuation of the active element side of a chip to a substrate, are learned. High density assembly is performed by mounting a bare chip in a module substrate using these connection methods with a chip size.

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EFFECT OF THE INVENTION

[Effect of the Invention] According to this invention, high density assembly becomes possible, suppressing amplification of the area which cutback-ization of the area which equipment occupies of is attained, and equipment occupies in the electronic instrument with which two or more electronic devices were mounted in the substrate by high density like a multi chip module. Moreover, since the electronic device mounted in the flexible substrate is closed while fixing the flexible substrate turned up with insulating adhesives according to this invention, it is not necessary to newly prepare a package, and structure can be simplified, and dependability can be raised.

[Translation done.]

* NOTICES *

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the manufacture approach of an electronic instrument and an electronic instrument.
[0002]
[Description of the Prior Art] In recent years, in connection with change of digitization of electronic equipment, improvement in the speed of a signal, etc., the request of control of the noise to electronic equipment or small-and-light-izing of electronic equipment is strong. Moreover, electronic parts, such as many electronic devices, are carried and it is necessary to control the signal delay during a chip by electronic equipment in recent years. In order to respond to such a request, two or more chips are close brought mutually on a substrate, and are arranged, and it mounts in high density, and controlling the signal delay during a chip is performed. As a technique of realizing the above high density assembly, two or more bare chips are carried in printed wired boards, such as a flexible substrate, it specifically considers as one component, and the so-called multi chip module (Multi-Chip Module:MCM) which mounts this in a base substrate is known.
[0003] Drawing 15 is the sectional view showing an example of the structure of a multi chip module. The multi chip module shown in drawing 15 mounts two or more chips 102 in the module substrate 101 with which the circuit pattern was formed at high density, and, thereby, is reducing the signal delay during a chip 102. Moreover, two or more connection lands are formed in the side face of the chip 102 of the module substrate 101 in which it does not carry, and each connection land is electrically connected to the connection land to which the base substrate 105 side corresponds through the connection ingredients 106, such as a solder bump. Furthermore, in order to strengthen the connection resilience of the module substrate 101 and the base substrate 105, area array arrangement is used for the connection land currently formed in the module substrate 101 and the base substrate 105.
[0004] In the above multi chip modules, the mounting approach to the module substrate 101 of a chip 102 for example, the pad of a chip 102 and the land of a module substrate -- a gold streak -- the wirebonding method connected by connection material, such as a wire, -- The TAB method which carries out inner lead bonding of the inner lead of a thin film pattern and the pad of an electronic device which consist of ingredients, such as Cu formed on the tape career, After forming the bump who consists of gold etc. on the pad of a chip, approaches, such as flip chip bonding which turns and carries out direct continuation of the active element side of a chip to a substrate, are learned. High density assembly is performed by mounting a bare chip in a module substrate using these connection methods with a chip size.
[0005]
[Problem(s) to be Solved by the Invention] By the way, as mentioned above, in order to realize high density assembly, when the chips which carry a bare chip in the multi chip module carried superficially increase in number from two pieces to four pieces, an area required for mounting of a module substrate will also increase to a twice as many abbreviation as this. Thus, it is necessary to make the area of a

module substrate expand in the former to the area of the chip to carry, and the increment in the number. If the area of a module substrate is made to expand, disadvantageous profit that the miniaturization (cutback-izing of area) of the electronic equipment by which a multi chip module is applied becomes difficult as a result exists.

[0006] This invention aims at offering the electronic instrument in which cutback-izing is possible and its manufacture approach of the area which equipment occupies in the electronic instrument with which two or more electronic devices were mounted in the substrate by high density like a multi chip module.

[0007]

[Means for Solving the Problem] It fills up with the electronic instrument of this invention between the flexible substrate which has the turned-up flexibility, the electronic device carried in the front face of said flexible substrate, and the opposed face which said turned-up flexible substrate counters, and it is equipped with the adhesives which consist of an insulating ingredient which fixes between the opposed faces concerned which counter.

[0008] Suitably, said electronic device is carried in fields other than the bending section of said flexible substrate.

[0009] Suitably, said electronic device is carried in the field which counters mutually [said turned-up flexible substrate].

[0010] Suitably, it fills up with said adhesives so that the electronic device carried in the opposed face of said flexible substrate may be covered.

[0011] The manufacture approach of the electronic instrument of this invention has the process which applies the adhesives which consist of an insulating ingredient to the field used as the process which carries an electronic device in the front face of the flexible substrate which has flexibility, and the opposed face which counters mutually [when said flexible substrate is turned up], and the process which turns up said flexible substrate and joins between said opposed faces.

[0012] Moreover, the manufacture approach of the electronic instrument of this invention has the process which applies the adhesives which consist of an insulating ingredient to the field used as the process which carries an electronic device in the front face of the flexible substrate which has flexibility, and the opposed face which counters mutually [when said flexible substrate is turned up], the process which turn up said flexible substrate and join between said opposed faces, and the process which carry said joined flexible substrate in a base substrate.

[0013] In this invention, the flexible substrate in which the electronic device was carried is turned up, and between the opposed faces of the bent flexible substrate, it is filled up with adhesives and fixes. That is, although it has a comparatively large area when it develops superficially, the flexible substrate in which the electronic device was carried turns up a flexible substrate, is considering as the structure the laminating of the electronic device having been carried out, and can carry out [****]-izing of the area which an electronic instrument occupies. In other words, the high density assembly of the part which can carry out [****]-izing of the area which an electronic instrument occupies, and an electronic device becomes possible. Moreover, it is not necessary to hold the flexible substrate with which the electronic device was newly carried in the package etc. by fixing the flexible substrate which is filled up with insulating adhesives between the opposed faces of the folded flexible substrate, and has flexibility.

[0014]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained with reference to a drawing. Drawing 1 is the sectional view showing the structure of the multi chip module concerning 1 operation gestalt of the electronic instrument of this invention. The multi chip module 1 is equipped with the turned-up flexible substrate 2, two or more semiconductor chips 3 as an electronic device of this invention carried in the front face of the flexible substrate 2, and the adhesives R with which it filled up between each opposed face which the turned-up flexible substrate 2 counters in drawing 1 . This multi chip module 1 is carried on the rigid base substrate 6.

[0015] The base substrate 6 forms an electric conduction circuit pattern in the substrate of inflexible hard nature with electrical conducting materials, such as Cu. It is the rigid printed board which printed the conductive circuit pattern on the insulating substrate which used the glass fabric as the base material,

sank in and specifically hardened resin, such as an epoxy resin and imide resin.
[0016] The flexible substrate 2 is a substrate which formed the conductive circuit pattern in the base film which has flexibility and insulation, and covered this circuit pattern with the covering film to it. For example, with the print technique, the conductive circuit pattern was formed in the base film fabricated from resin, such as polyester and polyimide, and it has covered with this circuit pattern covering film to it. The thickness of the flexible substrate 2 is about 30 micrometers.
[0017] This flexible substrate 2 consists of one substrate with which predetermined width of face continues, and is stacked up to four layers by being bent by three bending sections 2a in alignment with the longitudinal direction of the flexible substrate 2, 2b, and 2c.
[0018] The semiconductor chip 3 is mounted in the position of both sides of the flexible substrate 2 through the bump 8 and the anisotropy electrical conducting material 9 which consist of conductive ingredients, such as gold, in the state of the so-called bare chip. Thereby, the electronic circuitry formed in the semiconductor chip 3 is connected to the electric conduction circuit pattern and the electric target which were formed in the flexible substrate 2. Moreover, if the semiconductor chip 3 of these plurality is made into layer [1st] - the 4th layer from the base substrate 6 side at order among the flexible substrates 2 stacked up to four layers, it is carried in the flat part of each class of the flexible substrate 2. Namely, the semiconductor chip 3 is mounted in the opposed face of the 1st layer and the 2nd layer, respectively, and, as for the semiconductor chip 3 mounted in the opposed face of these 1st layer and the 2nd layer, the non-component side has countered mutually. The semiconductor chip 3 is carried also in each opposed face of the 2nd layer and the 3rd layer of the flexible substrate 2 which counters mutually, respectively, and, as for the semiconductor chip 3 mounted in the opposed face of these 2nd layer and the 3rd layer, the non-component side has countered mutually.
[0019] The semiconductor chip 3 is carried only in the opposed face by the side of the 3rd layer among the opposed faces of the 3rd layer and the 4th layer of the flexible substrate 2 which counter mutually, and the semiconductor chip 3 is not carried in the opposed face by the side of the 4th layer. Instead, the semiconductor chip 3 is carried in the lateral surface of the 4th layer of the flexible substrate 2.
[0020] Furthermore, the connection land which is connected with two or more bumps 7 who consist of conductive ingredients, such as gold, and which is not illustrated is formed in the field which counters the base substrate 6 of the 1st layer of the flexible substrate 2. That is, two or more connection lands are formed in the end section of the flexible substrate 2. Two or more connection lands formed in the end section of this flexible substrate 2 are arranged in the shape of a grid, in order to strengthen connection between the flexible substrate 2 and the base substrate 6. That is, in all directions, two or more connection lands formed in the end section of the flexible substrate 2 are predetermined pitches, and are arranged at equal intervals. Two or more connection lands formed in the end section of the flexible substrate 2 are connected with the connection land formed in the shape of a grid through the bump 7 corresponding to the base substrate 6. The flexible substrate 2 and the base substrate 6 are electrically connected by this.
[0021] Adhesives R consist of an insulating ingredient, and it fills up with them, respectively between the 1st layer of the flexible substrate 2, and the 2nd layer, between the 2nd layer and the 3rd layer, and between the 3rd layer and the 4th layer, and they are solidified. They have played the role which prevents semiconductor chip 3 comrades which counter contacting while it fills up with these adhesives R, respectively so that the semiconductor chip 3 carried in each opposed face of layer [1st] - the 4th layer may be covered, and they fix the relative position of layer [1st] - the 4th layer of the flexible substrate 2.
[0022] Next, the manufacture approach of the semiconductor device of this invention is explained. First, as shown in drawing 2 and drawing 3 , a semiconductor chip 3 is mounted in the position of the 2d of the one direction of the flexible substrate 2. For example, flip chip mounting performs mounting of a semiconductor chip 3. In addition, drawing 3 is the top view of drawing 2 R> 2. Moreover, on the other hand, the connection [section / of 2d of fields / end] land 7 of plurality [shape / of a grid] of the flexible substrate 2 is formed.
[0023] Here, with reference to drawing 9 - drawing 14 , an example of the mounting approach to the

flexible substrate 2 of a semiconductor chip 3 is explained. Drawing 9 is the sectional view showing the mounting structure of the semiconductor chip 3 mounted in the flexible substrate 2 by flip chip mounting. In drawing 9 , each connection pad, and the bump 8 and the anisotropy conductivity ingredient 9 of a semiconductor chip 3 connect connection land 2f formed in the flexible substrate 2.
[0024] First, bonding of the bump 8 who consists of conductive ingredients, such as gold, is carried out, and the mounting structure shown in drawing 9 forms her in each connection pad of a semiconductor chip 3, as shown in drawing 10 .
[0025] Subsequently, as shown in drawing 11 , the anisotropy conductivity film 12 which made the anisotropy conductivity ingredient 9 the shape of a film on the front face of the flexible substrate 2, and was held to covering tape 12a is stuck. This anisotropy conductivity ingredient 9 is an ingredient which scours conductive particles, such as silver, in resin, such as an epoxy resin, flows electrically only in the direction in which the pressure was applied, and serves as an insulating material to the other directions. As shown in drawing 12 , after sticking the anisotropy conductivity ingredient 9 of the anisotropy conductivity film 12 on the front face of the flexible substrate 2, covering tape 12a is torn off.
[0026] Subsequently, as shown in drawing 13 , alignment of the semiconductor chip 3 with which the bump 8 was formed is carried out to the flexible substrate 2 stuck on the anisotropy conductivity ingredient 9.
[0027] Subsequently, it pushes, heating a semiconductor chip 3 and the flexible substrate 2 using the sticking-by-pressure head which is not illustrated, where alignment of the semiconductor chip 3 is carried out to the flexible substrate 2, as shown in drawing 14 . Heating at this time and application-of-pressure conditions are temperature:160-190 degree C, pressure:20 - 60 kgf/cm2, and time amount:20s-30s.
[0028] By this heating and application of pressure, conductive particles, such as silver contained in the anisotropy conductivity ingredient 9, connect electrically between connection land 2f formed in the flexible substrate 2 with the bump 8. Flip chip mounting to the flexible substrate 2 of a semiconductor chip 3 is completed through the above processes.
[0029] Completion of flip chip mounting to the 2d of the one direction of the flexible substrate 2 of a semiconductor chip 3 carries out flip chip mounting of the semiconductor chip 3 similarly at another side side 2e of the flexible substrate 2, as shown in drawing 4 . Moreover, a semiconductor chip 3 is mounted in abbreviation regular intervals along with the longitudinal direction of the flexible substrate 2.
[0030] Subsequently, as shown in drawing 5 , where a semiconductor chip 3 is mounted in both sides of the flexible substrate 2, the insulating adhesives R are applied on the semiconductor chip 3 by the side of rear-face 2e of the bump 7 formed in the end section of the flexible substrate 2. At this time, using a dispenser 31, Adhesives R apply optimum dose so that a semiconductor chip 3 may be covered.
[0031] Subsequently, as shown in drawing 6 , the flexible substrate 2 is bent in the shape of U character so that the semiconductor chip 3 which applied Adhesives R, and the semiconductor chip 3 which adjoins this may counter, and the flexible substrate 2 is turned up. If the flexible substrate 2 is turned up, two semiconductor chips 3 of the flexible substrate 2 mounted in field 2e on the other hand will be in the condition of having countered through Adhesives R. That is, in the semiconductor chip 3 with which Adhesives R were not applied, it will be covered by folding of the flexible substrate 2 by Adhesives R. From the condition which turned up such a flexible substrate 2, when Adhesives R are stiffened, it is fixed to the condition that bending section 2a of the flexible substrate 2 as shown in drawing 6 was bent.

[0032] Subsequently, Adhesives R are applied on the semiconductor chip 3 mounted in 2d of another side sides of the flexible substrate 2 located above two semiconductor chips 3 in the condition which countered of having been mounted in the flexible substrate 2 in the condition of having been bent in the shape of U character. With having mentioned above, similarly, Adhesives R apply optimum dose so that a semiconductor chip 3 may be covered.
[0033] Subsequently, it bends so that the flexible substrate 2 may become S character-like, and the semiconductor chip 3 in the condition that the semiconductor chip 3 and Adhesives R which applied the

adhesives R carried in 2d of another side sides of the flexible substrate 2 are not applied is made to counter through Adhesives R, where Adhesives R are applied to the semiconductor chip 3 mounted in 2d of another side sides of the flexible substrate 2. In the semiconductor chip 3 which suited the condition that it was carried in 2d of another side sides of this flexible substrate 2, and Adhesives R were not applied, it will be covered by folding by bending of bending section 2b of the flexible substrate 2 by Adhesives R. The flexible substrate 2 is fixed to the condition of having lain one upon another in the shape of S character by hardening of Adhesives R.

[0034] By turning up so that the flexible substrate 2 may become S character-like, the flexible substrate 2 serves as a three-tiered structure. To the lateral surface of the lowest layer The connection land 7 is arranged, and it is arranged after the semiconductor chip 3 has countered the lowest layer and the opposed face of the 2nd layer, respectively. It is arranged after the semiconductor chip 3 has also countered the opposed face of the 2nd layer and the maximum upper layer, respectively, and it becomes a multi chip module in the condition that the semiconductor chip 3 was carried also in the lateral surface of the maximum upper layer. In addition, although it is necessary to change suitably the helicopter loading site of the semiconductor chip 3 to the flexible substrate 2, and to make the bending part of the flexible substrate 2 into three places when it is going to constitute the multi chip module of four layer systems shown in drawing 1 , the fundamental manufacture approach is the same.

[0035] Subsequently, as shown in drawing 8 , the multi chip module completed through the above processes is mounted in the base substrate 6. Mounting to the base substrate 6 is performed by mounting the connection land 7 of the flexible substrate 2 in the location where connection ingredients, such as soldering paste, were applied to the connection land formed in the position of the base substrate 6, and this connection ingredient was applied to it.

[0036] As mentioned above, according to this operation gestalt, since two or more semiconductor chips 3 are arranged through the flexible substrate 2, the signal delay between semiconductor chips 3 can be shortened, and improvement in the speed of the whole system which applied the multi chip module, and high performance-ization can be attained. Moreover, since according to this operation gestalt the flexible substrate 2 is turned up, the laminating of the semiconductor chip 3 is carried out spatially and high density assembly is realized, it can make the most of the limited mounting space.

[0037] Moreover, according to this operation gestalt, even if it expands the area (die length) of the flexible substrate 2 that it should correspond to the area of a semiconductor chip 3, or the increment in the number, in order to turn up the flexible substrate 2, the area which the final flexible substrate 2 occupies is not expanded. Furthermore, since amplification of the area of the flexible substrate 2 can be suppressed even if the area and the number of a semiconductor chip 3 increase, the area for mounting of the base substrate 6 which carries a multi chip module can also be controlled as a result.

[0038] Moreover, it is not necessary to newly wrap in a package the flexible substrate 2 which broke [was filled up with the insulating adhesives R and fixed between the flexible substrates 2 which according to this operation gestalt broke and became in heaviness,] in order to cover and protect a semiconductor chip 3 with Adhesives R, and became in heaviness, and the production process of a multi chip module can be simplified. That is, since it serves as the function which closes the mounted semiconductor chip 3 while fixing the flexible substrate 2 which folded Adhesives R with this operation gestalt, and became in heaviness with it, ** is possible, if the structure of a multi chip module can be simplified and dependability is raised.

[0039] Moreover, according to this operation gestalt, even if modification arises in the number of the components in a multi chip module, since relocation within a multi chip module is possible, it is not necessary to change the components layout on the base substrate 6. Moreover, in the case of such modification, the hierarchy of the flexible substrate 2 can be fluctuated or it can respond easily by modification of a bending location etc.

[0040] This invention is not limited to the operation gestalt mentioned above. Although the bending part of the flexible substrate 2 is set to 2 or 3 with the operation gestalt mentioned above, it is also possible for it not to be limited especially about the number of bending parts, but to make it a hierarchy further at many. Moreover, although the case where the singular semiconductor chip 3 was formed in the front

face and rear face of each class of the flexible substrate 2 after turning up was explained, it is also possible to consider as the configuration in which much more semiconductor chips 3 may be formed, and other electronic parts are carried besides semiconductor chip 3.

[0041]

[Effect of the Invention] According to this invention, high density assembly becomes possible, suppressing amplification of the area which cutback-ization of the area which equipment occupies of is attained, and equipment occupies in the electronic instrument with which two or more electronic devices were mounted in the substrate by high density like a multi chip module. Moreover, since the electronic device mounted in the flexible substrate is closed while fixing the flexible substrate turned up with insulating adhesives according to this invention, it is not necessary to newly prepare a package, and structure can be simplified, and dependability can be raised.

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MEANS

[Means for Solving the Problem] It fills up with the electronic instrument of this invention between the flexible substrate which has the turned-up flexibility, the electronic device carried in the front face of said flexible substrate, and the opposed face which said turned-up flexible substrate counters, and it is equipped with the adhesives which consist of an insulating ingredient which fixes between the opposed faces concerned which counter.
[0008] Suitably, said electronic device is carried in fields other than the bending section of said flexible substrate.
[0009] Suitably, said electronic device is carried in the field which counters mutually [said turned-up flexible substrate].
[0010] Suitably, it fills up with said adhesives so that the electronic device carried in the opposed face of said flexible substrate may be covered.
[0011] The manufacture approach of the electronic instrument of this invention has the process which applies the adhesives which consist of an insulating ingredient to the field used as the process which carries an electronic device in the front face of the flexible substrate which has flexibility, and the opposed face which counters mutually [when said flexible substrate is turned up], and the process which turns up said flexible substrate and joins between said opposed faces.
[0012] Moreover, the manufacture approach of the electronic instrument of this invention has the process which applies the adhesives which consist of an insulating ingredient to the field used as the process which carries an electronic device in the front face of the flexible substrate which has flexibility, and the opposed face which counters mutually [when said flexible substrate is turned up], the process which turn up said flexible substrate and join between said opposed faces, and the process which carry said joined flexible substrate in a base substrate.
[0013] In this invention, the flexible substrate in which the electronic device was carried is turned up, and between the opposed faces of the bent flexible substrate, it is filled up with adhesives and fixes. That is, although it has a comparatively large area when it develops superficially, the flexible substrate in which the electronic device was carried turns up a flexible substrate, is considering as the structure the laminating of the electronic device having been carried out, and can carry out [****]-izing of the area which an electronic instrument occupies. In other words, the high density assembly of the part which can carry out [****]-izing of the area which an electronic instrument occupies, and an electronic device becomes possible. Moreover, it is not necessary to hold the flexible substrate with which the electronic device was newly carried in the package etc. by fixing the flexible substrate which is filled up with insulating adhesives between the opposed faces of the folded flexible substrate, and has flexibility.
[0014]
[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained with reference to a drawing. Drawing 1 is the sectional view showing the structure of the multi chip module concerning 1 operation gestalt of the electronic instrument of this invention. The multi chip module 1 is equipped with the turned-up flexible substrate 2, two or more semiconductor chips 3 as an electronic device of this invention carried in the front face of the flexible substrate 2, and the adhesives R with

which it filled up between each opposed face which the turned-up flexible substrate 2 counters in drawing 1 . This multi chip module 1 is carried on the rigid base substrate 6.
[0015] The base substrate 6 forms an electric conduction circuit pattern in the substrate of inflexible hard nature with electrical conducting materials, such as Cu. It is the rigid printed board which printed the conductive circuit pattern on the insulating substrate which used the glass fabric as the base material, sank in and specifically hardened resin, such as an epoxy resin and imide resin.
[0016] The flexible substrate 2 is a substrate which formed the conductive circuit pattern in the base film which has flexibility and insulation, and covered this circuit pattern with the covering film to it. For example, with the print technique, the conductive circuit pattern was formed in the base film fabricated from resin, such as polyester and polyimide, and it has covered with this circuit pattern covering film to it. The thickness of the flexible substrate 2 is about 30 micrometers.
[0017] This flexible substrate 2 consists of one substrate with which predetermined width of face continues, and is stacked up to four layers by being bent by three bending sections 2a in alignment with the longitudinal direction of the flexible substrate 2, 2b, and 2c.
[0018] The semiconductor chip 3 is mounted in the position of both sides of the flexible substrate 2 through the bump 8 and the anisotropy electrical conducting material 9 which consist of conductive ingredients, such as gold, in the state of the so-called bare chip. Thereby, the electronic circuitry formed in the semiconductor chip 3 is connected to the electric conduction circuit pattern and the electric target which were formed in the flexible substrate 2. Moreover, if the semiconductor chip 3 of these plurality is made into layer [1st] - the 4th layer from the base substrate 6 side at order among the flexible substrates 2 stacked up to four layers, it is carried in the flat part of each class of the flexible substrate 2. Namely, the semiconductor chip 3 is mounted in the opposed face of the 1st layer and the 2nd layer, respectively, and, as for the semiconductor chip 3 mounted in the opposed face of these 1st layer and the 2nd layer, the non-component side has countered mutually. The semiconductor chip 3 is carried also in each opposed face of the 2nd layer and the 3rd layer of the flexible substrate 2 which counters mutually, respectively, and, as for the semiconductor chip 3 mounted in the opposed face of these 2nd layer and the 3rd layer, the non-component side has countered mutually.
[0019] The semiconductor chip 3 is carried only in the opposed face by the side of the 3rd layer among the opposed faces of the 3rd layer and the 4th layer of the flexible substrate 2 which counter mutually, and the semiconductor chip 3 is not carried in the opposed face by the side of the 4th layer. Instead, the semiconductor chip 3 is carried in the lateral surface of the 4th layer of the flexible substrate 2.
[0020] Furthermore, the connection land which is connected with two or more bumps 7 who consist of conductive ingredients, such as gold, and which is not illustrated is formed in the field which counters the base substrate 6 of the 1st layer of the flexible substrate 2. That is, two or more connection lands are formed in the end section of the flexible substrate 2. Two or more connection lands formed in the end section of this flexible substrate 2 are arranged in the shape of a grid, in order to strengthen connection between the flexible substrate 2 and the base substrate 6. That is, in all directions, two or more connection lands formed in the end section of the flexible substrate 2 are predetermined pitches, and are arranged at equal intervals. Two or more connection lands formed in the end section of the flexible substrate 2 are connected with the connection land formed in the shape of a grid through the bump 7 corresponding to the base substrate 6. The flexible substrate 2 and the base substrate 6 are electrically connected by this.
[0021] Adhesives R consist of an insulating ingredient, and it fills up with them, respectively between the 1st layer of the flexible substrate 2, and the 2nd layer, between the 2nd layer and the 3rd layer, and between the 3rd layer and the 4th layer, and they are solidified. They have played the role which prevents semiconductor chip 3 comrades which counter contacting while it fills up with these adhesives R, respectively so that the semiconductor chip 3 carried in each opposed face of layer [1st] - the 4th layer may be covered, and they fix the relative position of layer [1st] - the 4th layer of the flexible substrate 2.
[0022] Next, the manufacture approach of the semiconductor device of this invention is explained. First, as shown in drawing 2 and drawing 3 , a semiconductor chip 3 is mounted in the position of the 2d of

the one direction of the flexible substrate 2. For example, flip chip mounting performs mounting of a semiconductor chip 3. In addition, drawing 3 is the top view of drawing 2 R> 2. Moreover, on the other hand, the connection [section / of 2d of fields / end] land 7 of plurality [shape / of a grid] of the flexible substrate 2 is formed.

[0023] Here, with reference to drawing 9 - drawing 14 , an example of the mounting approach to the flexible substrate 2 of a semiconductor chip 3 is explained. Drawing 9 is the sectional view showing the mounting structure of the semiconductor chip 3 mounted in the flexible substrate 2 by flip chip mounting. In drawing 9 , each connection pad, and the bump 8 and the anisotropy conductivity ingredient 9 of a semiconductor chip 3 connect connection land 2f formed in the flexible substrate 2.

[0024] First, bonding of the bump 8 who consists of conductive ingredients, such as gold, is carried out, and the mounting structure shown in drawing 9 forms her in each connection pad of a semiconductor chip 3, as shown in drawing 10 .

[0025] Subsequently, as shown in drawing 11 , the anisotropy conductivity film 12 which made the anisotropy conductivity ingredient 9 the shape of a film on the front face of the flexible substrate 2, and was held to covering tape 12a is stuck. This anisotropy conductivity ingredient 9 is an ingredient which scours conductive particles, such as silver, in resin, such as an epoxy resin, flows electrically only in the direction in which the pressure was applied, and serves as an insulating material to the other directions. As shown in drawing 12 , after sticking the anisotropy conductivity ingredient 9 of the anisotropy conductivity film 12 on the front face of the flexible substrate 2, covering tape 12a is torn off.

[0026] Subsequently, as shown in drawing 13 , alignment of the semiconductor chip 3 with which the bump 8 was formed is carried out to the flexible substrate 2 stuck on the anisotropy conductivity ingredient 9.

[0027] Subsequently, it pushes, heating a semiconductor chip 3 and the flexible substrate 2 using the sticking-by-pressure head which is not illustrated, where alignment of the semiconductor chip 3 is carried out to the flexible substrate 2, as shown in drawing 14 . Heating at this time and application-of-pressure conditions are temperature:160-190 degree C, pressure:20 - 60 kgf/cm2, and time amount:20s-30s.

[0028] By this heating and application of pressure, conductive particles, such as silver contained in the anisotropy conductivity ingredient 9, connect electrically between connection land 2f formed in the flexible substrate 2 with the bump 8. Flip chip mounting to the flexible substrate 2 of a semiconductor chip 3 is completed through the above processes.

[0029] Completion of flip chip mounting to the 2d of the one direction of the flexible substrate 2 of a semiconductor chip 3 carries out flip chip mounting of the semiconductor chip 3 similarly at another side side 2e of the flexible substrate 2, as shown in drawing 4 . Moreover, a semiconductor chip 3 is mounted in abbreviation regular intervals along with the longitudinal direction of the flexible substrate 2.

[0030] Subsequently, as shown in drawing 5 , where a semiconductor chip 3 is mounted in both sides of the flexible substrate 2, the insulating adhesives R are applied on the semiconductor chip 3 by the side of rear-face 2e of the bump 7 formed in the end section of the flexible substrate 2. At this time, using a dispenser 31, Adhesives R apply optimum dose so that a semiconductor chip 3 may be covered.

[0031] Subsequently, as shown in drawing 6 , the flexible substrate 2 is bent in the shape of U character so that the semiconductor chip 3 which applied Adhesives R, and the semiconductor chip 3 which adjoins this may counter, and the flexible substrate 2 is turned up. If the flexible substrate 2 is turned up, two semiconductor chips 3 of the flexible substrate 2 mounted in field 2e on the other hand will be in the condition of having countered through Adhesives R. That is, in the semiconductor chip 3 with which Adhesives R were not applied, it will be covered by folding of the flexible substrate 2 by Adhesives R. From the condition which turned up such a flexible substrate 2, when Adhesives R are stiffened, it is fixed to the condition that bending section 2a of the flexible substrate 2 as shown in drawing 6 was bent.

[0032] Subsequently, Adhesives R are applied on the semiconductor chip 3 mounted in 2d of another side sides of the flexible substrate 2 located above two semiconductor chips 3 in the condition which

countered of having been mounted in the flexible substrate 2 in the condition of having been bent in the shape of U character. With having mentioned above, similarly, Adhesives R apply optimum dose so that a semiconductor chip 3 may be covered.

[0033] Subsequently, it bends so that the flexible substrate 2 may become S character-like, and the semiconductor chip 3 in the condition that the semiconductor chip 3 and Adhesives R which applied the adhesives R carried in 2d of another side sides of the flexible substrate 2 are not applied is made to counter through Adhesives R, where Adhesives R are applied to the semiconductor chip 3 mounted in 2d of another side sides of the flexible substrate 2. In the semiconductor chip 3 which suited the condition that it was carried in 2d of another side sides of this flexible substrate 2, and Adhesives R were not applied, it will be covered by folding by bending of bending section 2b of the flexible substrate 2 by Adhesives R. The flexible substrate 2 is fixed to the condition of having lain one upon another in the shape of S character by hardening of Adhesives R.

[0034] By turning up so that the flexible substrate 2 may become S character-like, the flexible substrate 2 serves as a three-tiered structure. To the lateral surface of the lowest layer The connection land 7 is arranged, and it is arranged after the semiconductor chip 3 has countered the lowest layer and the opposed face of the 2nd layer, respectively. It is arranged after the semiconductor chip 3 has also countered the opposed face of the 2nd layer and the maximum upper layer, respectively, and it becomes a multi chip module in the condition that the semiconductor chip 3 was carried also in the lateral surface of the maximum upper layer. In addition, although it is necessary to change suitably the helicopter loading site of the semiconductor chip 3 to the flexible substrate 2, and to make the bending part of the flexible substrate 2 into three places when it is going to constitute the multi chip module of four layer systems shown in drawing 1 , the fundamental manufacture approach is the same.

[0035] Subsequently, as shown in drawing 8 , the multi chip module completed through the above processes is mounted in the base substrate 6. Mounting to the base substrate 6 is performed by mounting the connection land 7 of the flexible substrate 2 in the location where connection ingredients, such as soldering paste, were applied to the connection land formed in the position of the base substrate 6, and this connection ingredient was applied to it.

[0036] As mentioned above, according to this operation gestalt, since two or more semiconductor chips 3 are arranged through the flexible substrate 2, the signal delay between semiconductor chips 3 can be shortened, and improvement in the speed of the whole system which applied the multi chip module, and high performance-ization can be attained. Moreover, since according to this operation gestalt the flexible substrate 2 is turned up, the laminating of the semiconductor chip 3 is carried out spatially and high density assembly is realized, it can make the most of the limited mounting space.

[0037] Moreover, according to this operation gestalt, even if it expands the area (die length) of the flexible substrate 2 that it should correspond to the area of a semiconductor chip 3, or the increment in the number, in order to turn up the flexible substrate 2, the area which the final flexible substrate 2 occupies is not expanded. Furthermore, since amplification of the area of the flexible substrate 2 can be suppressed even if the area and the number of a semiconductor chip 3 increase, the area for mounting of the base substrate 6 which carries a multi chip module can also be controlled as a result.

[0038] Moreover, it is not necessary to newly wrap in a package the flexible substrate 2 which broke [was filled up with the insulating adhesives R and fixed between the flexible substrates 2 which according to this operation gestalt broke and became in heaviness,] in order to cover and protect a semiconductor chip 3 with Adhesives R, and became in heaviness, and the production process of a multi chip module can be simplified. That is, since it serves as the function which closes the mounted semiconductor chip 3 while fixing the flexible substrate 2 which folded Adhesives R with this operation gestalt, and became in heaviness with it, ** is possible, if the structure of a multi chip module can be simplified and dependability is raised.

[0039] Moreover, according to this operation gestalt, even if modification arises in the number of the components in a multi chip module, since relocation within a multi chip module is possible, it is not necessary to change the components layout on the base substrate 6. Moreover, in the case of such modification, the hierarchy of the flexible substrate 2 can be fluctuated or it can respond easily by

modification of a bending location etc.
[0040] This invention is not limited to the operation gestalt mentioned above. Although the bending part of the flexible substrate 2 is set to 2 or 3 with the operation gestalt mentioned above, it is also possible for it not to be limited especially about the number of bending parts, but to make it a hierarchy further at many. Moreover, although the case where the singular semiconductor chip 3 was formed in the front face and rear face of each class of the flexible substrate 2 after turning up was explained, it is also possible to consider as the configuration in which much more semiconductor chips 3 may be formed, and other electronic parts are carried besides semiconductor chip 3.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the sectional view showing the structure of the multi chip module concerning 1 operation gestalt of the electronic instrument of this invention.
[Drawing 2] It is a sectional view for explaining the production process of a multi chip module shown in drawing 1 .
[Drawing 3] It is the top view of the flexible substrate shown in drawing 2 .
[Drawing 4] It is a sectional view for explaining the production process following drawing 2 .
[Drawing 5] It is a sectional view for explaining the production process following drawing 4 .
[Drawing 6] It is a sectional view for explaining the production process following drawing 5 .
[Drawing 7] It is a sectional view for explaining the production process following drawing 6 .
[Drawing 8] It is a sectional view for explaining the production process following drawing 7 .
[Drawing 9] It is the sectional view showing an example of the structure of the multi chip module by which flip chip mounting was carried out.
[Drawing 10] It is drawing for explaining an example of the mounting process of flip chip mounting.
[Drawing 11] It is drawing for explaining the mounting process following drawing 10 .
[Drawing 12] It is drawing for explaining the mounting process following drawing 11 .
[Drawing 13] It is drawing for explaining the mounting process following drawing 12 .
[Drawing 14] It is drawing for explaining the mounting process following drawing 13 .
[Drawing 15] It is the sectional view showing an example of the structure of a multi chip module.
[Description of Notations]
1 [-- A bump, R / -- Adhesives.] -- A multi chip module, 2 -- A flexible substrate, 3 -- A semiconductor chip, 8

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] An electronic instrument equipped with the adhesives which consist of an insulating ingredient with which it fills up between the flexible substrate which has the turned-up flexibility, the electronic device carried in the front face of said flexible substrate, and the opposed face which said turned-up flexible substrate counters, and which fixes between the opposed faces concerned which counter.
[Claim 2] Said electronic device is an electronic instrument according to claim 1 carried in fields other than the bending section of said flexible substrate.
[Claim 3] Said flexible substrate is an electronic instrument according to claim 1 turned up by three or more layers.
[Claim 4] Said electronic device is an electronic instrument according to claim 1 carried in the field which counters mutually [said turned-up flexible substrate].
[Claim 5] Said flexible substrate is an electronic instrument according to claim 1 which equips the end section of the longitudinal direction of the flexible substrate concerned with the connection land connected to the base substrate in which said electronic instrument is carried.
[Claim 6] Said connection land is an electronic instrument according to claim 5 arranged in the shape of a grid.
[Claim 7] Said electronic device is an electronic instrument according to claim 1 by which flip chip mounting is carried out at said flexible substrate.
[Claim 8] Said electronic device is an electronic instrument according to claim 1 carried in said flexible substrate in the state of the bare chip.
[Claim 9] Said adhesives are electronic instruments according to claim 1 with which it fills up so that the electronic device carried in the opposed face of said flexible substrate may be covered.
[Claim 10] The manufacture approach of an electronic instrument of having the process which applies the adhesives which consist of an insulating ingredient to the field used as the process which carries an electronic device in the front face of the flexible substrate which has flexibility, and the opposed face which counters mutually [when said flexible substrate is turned up], and the process which turns up said flexible substrate and joins between said opposed faces.
[Claim 11] The process which carries said electronic device is the manufacture approach of an electronic instrument according to claim 10 of carrying said electronic device in the field used as the opposed face which counters mutually [when said flexible substrate is turned up].
[Claim 12] The process which applies said adhesives is the manufacture approach of the electronic instrument according to claim 11 applied so that the electronic device in which said adhesives were carried by said opposed face may be covered.
[Claim 13] The process which carries said electronic device is the manufacture approach of the electronic instrument according to claim 10 which carries out flip chip mounting of said electronic device.
[Claim 14] The manufacture approach of an electronic instrument of having the process which applies

the adhesives which consist of an insulating ingredient to the field used as the process which carries an electronic device in the front face of the flexible substrate which has flexibility, and the opposed face which counters mutually [when said flexible substrate is turned up], the process which turns up said flexible substrate and joins between said opposed faces, and the process which carries said joined flexible substrate in a base substrate.

[Translation done.]